

HW 4 Binomial and Normal Distributions (12.5-12.6)

I will be able to find binomial and normal distribution probabilities.

Name key

A coin is flipped 8 times. Find the probability of each event. $P = {}_nC_r (p)^r (1-p)^{n-r}$

1.) exactly 2 heads

$${}_8C_2 (.5)^2 (.5)^6 = 0.109$$

10.9%

2.) exactly 8 heads

$${}_8C_8 (.5)^8 = 0.0039$$

$\frac{1}{256}$.4%

A family has 4 children. Find the probability of each event, assuming that having a boy is as likely as having a girl.

3.) exactly 2 boys

$${}_4C_2 (.5)^2 (.5)^2 = 0.375$$

37.5%

4.) all girls

$${}_4C_4 (.5)^4 = 0.0625$$

6.25%

Suppose that 70% of the adults in a city are registered voters. In a group of 10 randomly selected adults in the city, find the probability for the following:

5.) exactly 5 are registered voters

$${}_{10}C_5 (.7)^5 (.3)^5 = .1029$$

10.29%

6.) at least 6 are registered voters

$$P(6 \text{ or } 7 \text{ or } 8 \text{ or } 9 \text{ or } 10) =$$

$${}_{10}C_6 (.7)^6 (.3)^4 + {}_{10}C_7 (.7)^7 (.3)^3 + {}_{10}C_8 (.7)^8 (.3)^2$$

$$+ {}_{10}C_9 (.7)^9 (.3) + {}_{10}C_{10} (.7)^{10}$$

$$= .200 + .267 + .233 + .121 + .028 = 0.849$$

84.9%

7.) at most 6 are registered voters

$$P(\text{less than } 6) = 1 - 0.849 = 0.151$$

$$0.151 + .200 = 0.351$$

35.1%

8.) 2 are not registered voters

$${}_{10}C_2 (.3)^2 (.7)^8 = .233$$

23.3%

A person randomly selects answers to all 10 questions on a multiple choice quiz. Each question has 1 correct answer and 3 incorrect answers. Find the probability of the following:

$$P(\text{correct}) = .25$$

9.) exactly 6 questions are correct

$${}_{10}C_6 (.25)^6 (.75)^4 = 0.0162$$

1.62%

10.) at most 3 are correct

$$P = {}_{10}C_0 (.25)^0 (.75)^{10} + {}_{10}C_1 (.25)^1 (.75)^9 +$$

$${}_{10}C_2 (.25)^2 (.75)^8 + {}_{10}C_3 (.25)^3 (.75)^7$$

$$= .0563 + 0.188 + 0.282 + 0.250 = .776$$

77.6%

11.) at least 5 are correct

$$P(5 \text{ or } 6 \text{ or } 7 \text{ or } 8 \text{ or } 9 \text{ or } 10) =$$

$${}_{10}C_4 (.25)^4 (.75)^6 + {}_{10}C_5 (.25)^5 (.75)^5 + {}_{10}C_6 (.25)^6 (.75)^4 +$$

$${}_{10}C_7 (.25)^7 (.75)^3 + {}_{10}C_8 (.25)^8 (.75)^2 + {}_{10}C_9 (.25)^9 (.75)^1 +$$

$${}_{10}C_{10} (.25)^{10} = .146 + .276 = .422$$

42.2%

12.) at least 8 are correct

$$P(8 \text{ or } 9 \text{ or } 10) =$$

$${}_{10}C_8 (.25)^8 (.75)^2 + {}_{10}C_9 (.25)^9 (.75)^1 +$$

$${}_{10}C_{10} (.25)^{10} = 4.158 \times 10^{-4}$$

.04158%